252(d)(1).[772] In addition, we believe this conclusion is consistent with Congress's overriding goal of promoting efficient competition for local telephony services, because it will allow, in the long term, new entrants using unbundled elements to compete on the basis of the economic costs underlying the incumbent LECs' networks. The facilities used to provide exchange access services are the same as those used to provide local exchange services. We note, however, as discussed below,[773] that certain additional charges are necessary for a specific, limited duration to smooth the transition to a competitive marketplace.

364. We further conclude that when a carrier purchases a local loop for the purpose of providing interexchange services or exchange access services,[774] incumbent LECs may not recover the subscriber line charge (SLC) now paid by end users. The SLC recovers the portion of loop costs allocated to the interstate jurisdiction, but as discussed in Section II.C, *supra*, we conclude that the 1996 Act creates a new jurisdictional regime outside of the current separations process. The unbundled loop charges paid by new entrants under section 251(c)(3) will therefore recover the unseparated cost of the loop, including the interstate component now recovered through the SLC. If end users or carriers purchasing access to local loops were required to pay the SLC in this situation, LECs would enjoy double recovery, and the effective price of unbundled loops would exceed the cost-based levels required under section 251(d)(1).

365. Finally, we have considered the economic impact on small incumbent LECs of our conclusion that carriers purchasing access to unbundled network elements to provide interexchange or exchange access services are not required to pay federal or state access charges, except as described in Section VII, *infra,* for a temporary period. For example, the Rural Telephone Coalition argues that rural ratepayers could be subject to higher local service rates if interexchange carriers are allowed to bypass access charges through the purchase of unbundled elements before proceedings regarding access reform and universal service are completed. We reject the Rural Telephone Coalition's argument, however, because our rules, as discussed in Section VII, *infra*, provide for a limited, transitional plan to address public policy concerns raised by the bypass of access charges through unbundled network elements.

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[772] *See infra,* Section VII. We also note that where new entrants purchase access to unbundled network elements to provide exchange access services, whether or not they are also offering toll services through such elements, the new entrants may assess exchange access charges to IXCs originating or terminating toll calls on those elements. In these circumstances, incumbent LECs may not assess exchange access charges to such IXCs because the new entrants, rather than the incumbents, will be providing exchange access services, and to allow otherwise would permit incumbent LECs to receive compensation in excess of network costs in violation of the pricing standard in section 252(d). *See* 47 U.S.C. § 252. We further note, however, that in these same circumstances the new entrant purchasing access to an unbundled switch element must pay to the incumbent LEC the charges included in the transitional mechanism, described *infra,* at Section VII, for a temporary period.

[773] *See infra,* Section VII, discussing an interim mechanism addressing near-term access charge bypass.

[774] As discussed at *infra*, Section VIII, a different result will occur when interconnecting carriers purchase LEC retail services at wholesale rates under section 251(c)(4).

J. Specific Unbundling Requirements

366. Having interpreted the standards set forth in the 1996 Act for the unbundling of network elements, we now apply those standards to incumbent LECs' networks. Based on the information developed in this proceeding, we require incumbent LECs to provide unbundled access to local loops, network interface devices, local and tandem switching capability, interoffice transmission facilities, signaling and call-related databases, operations support systems functions, and operator services and directory assistance facilities, as described below. These network elements represent a minimum set of elements that must be unbundled by incumbent LECs. State commissions, as previously noted, are free to prescribe additional elements, and parties may agree on additional network elements in the voluntary negotiation process.

1. Local Loops

a. Background

367. In the NPRM, we tentatively concluded that incumbent LECs should be required to unbundle local loops. We sought comment on appropriate requirements for loop unbundling that would promote entry and build upon existing state initiatives, and whether we should adopt specific provisioning requirements for loop unbundling. We also sought comment on our tentative conclusion that incumbent LECs should make available as individual network elements various subloop elements such as the feeder, distribution, and concentration equipment.

b. Comments

368. Virtually all parties that discuss local loop unbundling support the NPRM's tentative conclusion that the local loop is a network element that should be unbundled.[775] These commenters assert that unbundling local loops is consistent with congressional intent,[776] and that

[775] *See, e.g.*, Bell Atlantic comments at 22; ACTA comments at 23; LCI comments at 17; Comcast comments at 20; Matanuska Tel. at 2; ACSI comments at 35; CompTel comments at 30; Illinois Commission comments at 39; U S West comments at 47; Ameritech comments at 36; District of Columbia Commission at 23; Time Warner comments at 44-45; ALTS comments at 26; TIA comments at 9; Sprint comments at 30; NCTA comments at 37; Matanuska Tel. comments at 2; *but see* GTE comments at 33 ("there is no evident need for FCC intervention. Several states are already addressing such matters . . . Moreover, because several carriers are already providing unbundled loops pursuant to state requirements, FCC action is not necessary to assure progress by states").

[776] *See, e.g.*, Hyperion comments at 18; District of Columbia Commission comments at 23; Ameritech comments at 35; NTIA reply at 9-10; SNET comments at 22-23; MFS comments at 42; ACSI comments at 35.

doing so is technically feasible.[777] In addition, a number of state commissions note that they already require incumbent LECs to unbundle local loops.[778] In support of loop unbundling, several commenters cite ongoing unbundled loop arrangements between incumbent LECs and competing providers.[779] MFS asserts that the local loop is the most formidable entry barrier to the local exchange market and has the strongest bottleneck characteristics of any network element.[780]

369. There is disagreement, however, over how the local loop should be defined. Some commenters recommend a definition that would encompass the basic loop facilities and would not attempt to delineate all loop technologies.[781] Parties that favor a broad definition of local loop suggest some variation on the following: the communications path between the main distribution frame (MDF) in the central office and the network interface device (NID) at the customer premises.[782] USTA, PacTel, and BellSouth contend that such a definition complies with the 1996 Act and allows private negotiations to address the specific network architectures of incumbent LECs and the needs of the particular requesting carriers.[783]

370. Other commenters support a definition of the local loop that would require incumbent LECs to provide, where facilities exist or can be upgraded, five categories of local loops: 2-wire voice-grade analog lines, 2-wire Integrated Services Digital Network (ISDN) lines,

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[777] *See, e.g.*, Citizens Utilities comments at 15; PacTel reply at 18; New York Commission comments at 26; SBA comments at 13-14; TIA comments at 9; Texas Commission comments at 9, 17; ACSI comments at 35; NYNEX comments at 64-65; MCI comments at 29; GTE reply at 18. AT&T, for example, asserts that tariffs filed by Ameritech, SNET, NYNEX, SBC, and Bell Atlantic permit the interconnection of a competitor's switch to the incumbent LEC's loop. Letter from Betsy Brady and Bruce Cox, AT&T, to Regina Keeney, Chief, Common Carrier Bureau, FCC, Mar. 21, 1996 (AT&T March 21 Letter) at 18.

[778] *See, e.g.*, Alabama Commission comments at 18; Texas Commission comments at 17; Arizona Commission comments, Exhibit V at 8; New York Commission comments at 26; Oklahoma Commission comments, Attachment A at 13; Iowa Commission comments, Attachment B at 4.

[779] *See, e.g.*, PacTel comments at 52 (noting that it has an agreement to provide MFS with unbundled loops); Ameritech comments at 36 (by the end of 1996, over 45,000 of its unbundled loops will be used by interconnecting carriers); Frontier comments at 14 (Rochester Telephone is currently providing unbundled loops pursuant to tariff.)

[780] MFS comments at 42; *accord* MCI comments at 29; IDCMA reply at 10; Ameritech comments at 35; MECA comments at 38; CompTel comments at 30; ALTS comments at 26.

[781] USTA comments at 29; U S West comments at 47; Wyoming Commission comments at 24; PacTel comments at 52-53; BellSouth comments at 37 n.82; Sprint comments at 30.

[782] U S West comments at 47; Teleport comments at 35-36; MECA comments at 28; Ameritech comments at 36; NYNEX comments at 62 n.123; Frontier comments at 14; USTA comments at 29.

[783] USTA comments at 29; PacTel comments at 52-53; BellSouth comments at 37-38.

2-wire High-Bit-Rate Digital Subscriber Lines (HDSL), 4-wire HDSL, and 4-wire DS-1 lines.[784] These parties argue that guidance from the Commission on specific loop categories will minimize complex and resource-intensive disputes between incumbent LECs and requesting carriers by avoiding disagreements over whether a particular loop functionality qualifies as a "loop."[785] ITIC contends that the ability of new entrants to provide various digital loop functions, in competition with the incumbent LEC, is likely to stimulate entry by small entities.[786]

371. Connecticut and Texas have established different definitions of unbundled local loop functionality. The Connecticut Department of Public Utility Control has ordered SNET to unbundle 2-wire voice-grade links, 2-wire ISDN links, and 4-wire DS-1 links.[787] The Texas Commission has a similar definition, but specifically excludes DS1, DS3, and fiber loops interfacing with SONET, which the Texas Commission notes can be purchased as private line services.[788] Criticizing the approach taken by the Texas Commission, ACSI and Intermedia argue that DS1 and DS3-level loops, as well as analog voice and ISDN loops, should be considered unbundled loops.[789]

372. Potential local competitors contend that an incumbent LEC should be required to modify an existing loop when a requesting carrier seeks to provide a particular type of loop capability that is not technically feasible under the loop's existing architecture.[790] MFS notes that an incumbent LEC typically will take the steps necessary to provide a particular loop functionality, such as ISDN, to a customer when that customer's existing loop is incapable of supporting the requested functionality.[791] Therefore, MFS and GST propose that the loop types available to requesting carriers should match those made available by the incumbent LEC to end-user customers within the same geographic area.[792]

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[784] MFS comments at 43-44; GST comments at 21-22; ALTS comments at 27; *but see* Bell Atlantic reply at 10 (HDSL links are actually subloop elements and should only be available through a bona fide request process).

[785] MFS comments at 42; GST comments at 20; Intermedia comments at 10.

[786] ITIC comments at 7-8.

[787] Connecticut Commission comments, Att. B at 2.

[788] Texas Commission comments at 17-18.

[789] ACSI comments, Attachment 1 at 2-3; Intermedia comments at 10.

[790] AT&T comments at 29-30; MFS comments at 43; ALTS comments at 27; GST comments at 21.

[791] MFS comments at 43.

[792] MFS comments at 44; *accord* NYNEX comments at 64.

373. A number of potential local competitors request that the Commission adopt specific requirements governing loop unbundling. MFS and GST recommend adoption of a rule that would establish five minutes as the standard interruption interval during which a customer's loop is disconnected from the incumbent LEC's switch and reconnected to a competitor's switch.[793] Opposing MFS's proposed five-minute loop-cutover requirement, GTE argues that the process simply may take longer than five minutes, and that the cutover interval should be addressed through negotiations.[794] Intermedia and Teleport complain that incumbent LECs have abused their control over intra-office cables that connect unbundled loops to the competitor's collocated equipment, and they ask that the Commission prohibit such practices.[795] A number of potential local competitors request that the Commission specifically require incumbent LECs to provide unbundled loops even when the LEC uses an integrated digital loop carrier (IDLC)[796] to deliver a particular loop to the central office. These parties argue that the incumbent LEC could either move the requested loop from the IDLC to another loop carrier, or could employ demultiplexing equipment at the central office.[797]

374. *Subloop unbundling.* Commenters disagree over the Commission's tentative conclusion to identify subloop components as individual network elements. Parties that support a national subloop unbundling requirement argue that subloop unbundling is technically feasible and will enhance competition by allowing a competitor to purchase from the incumbent only those loop facilities that it cannot provide itself.[798] These parties identify the feeder, distribution, and feeder/distribution interface as the appropriate subloop elements.[799] Some parties would add to those components the network interface device, which, in most states, is the demarcation point

[793] MFS comments at 45; GST comments at 22-23.

[794] GTE reply at 18-19, n.32.

[795] Intermedia comments at 8-9; Teleport comments at 36-37.

[796] An IDLC carries aggregated loop traffic from the point of concentration in the LEC's loop facilities directly into the switch via a multiplexed circuit.

[797] MFS comments at 45-46 n.58; AT&T reply at 12; GST comments at 23; MCI reply at 30.

[798] LCI comments at 17; MCI comments at 16; ACSI comments at 38-39; TCC comments at 35-37; AT&T comments at 1; Telecommunications Resellers Ass'n comments at 34; *see also* ACSI reply at 17 (ACSI plans to deploy switches and fiber rings that would replace the incumbent LEC's feeder plant, but would still need access to the incumbent LEC's loop distribution and, occasionally, loop concentration and multiplexing functionality).

[799] *See, e.g.*, ACSI comments at 36-37 AT&T comments at 19; TIA comments at 11-12; Cable & Wireless comments at 19; ACTA comments at 19; IDCMA reply at 12-13. Other carriers seek access to digital loop carriers and analog cross-connects. MCI comments at 29; ACTA comments at 29; LCI comments at 17; TCC comments at 37.

between incumbent LECs' outside plant and customers' inside wiring.[800] AT&T and MCI contend that the feeder, FDI, and distribution segments of the local loop perform different functions and are, therefore, logically separable.[801] ACSI asserts that, just as different loop architectures have not prevented states from unbundling local loops, different subloop architectures should not prevent subloop unbundling.[802] ITIC, ITAA and Compaq assert that subloop unbundling will facilitate the provision of high capacity loop functions and lead to innovative new data services.[803] SBA contends that subloop unbundling will facilitate entry by small businesses by allowing them to begin competing in smaller markets, and by minimizing the number of unnecessary elements they would need to purchase.[804]

375. Incumbent LECs argue that subloop unbundling is not critical for potential competitors to enter the local exchange market.[805] Bell Atlantic and GTE note that the comments of parties considered to be potential beneficiaries of subloop unbundling, such as cable operators and CAPs, express little interest in obtaining subloop elements.[806] In addition, Bell Atlantic, Ameritech, and U S West claim that every state commission that has examined the possibility of requiring subloop unbundling has rejected it.[807] Ameritech notes that no competitor has used the bona fide request process that Illinois made available over a year ago for subloop unbundling requests.[808] Ameritech also points out that MFS did not demand subloop unbundling in its recent

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[800] *See, e.g.*, MCI comments at 16; IDCMA reply at 12; ACTA comments at 19; GCI comments at 12; LDDS comments at 41-42; MFS comments at 43 n.54; TCC comments at 36; Telecommunications Resellers Ass'n comments at 33; LCI comments at 17.

[801] AT&T comments at 19; MCI comments at 16. According to MCI, the connection is made via a patch panel, where a competitor could easily interconnect its own feeder facilities.

[802] ACSI reply at 14.

[803] Letter from Colleen Boothby, Levine, Blaszak, Block & Boothby (on behalf of the Information Technology Industry Council's FCC Working Group), to William F. Caton, Secretary, FCC, July 16, 1996 (ITIC July 16 *Ex Parte*); Letter from Joseph Markoski, Squire, Sanders & Dempsey (on behalf of the Information Technology Association of America) to William F. Caton, Secretary, FCC, July 22, 1996 (ITAA July 19 *Ex Parte*), Letter from Robert Stearns, Senior Vice President, Compaq Computer Corporation, to Susan Ness, Commissioner, FCC, July 23, 1996 (Compaq July 23 *Ex Parte*), Letter from Dhruv Khanna, Senior Communications Attorney, Intel Corporation, to Reed Hundt, Chairman, FCC, July 25, 1996 (Intel July 25 *Ex Parte*).

[804] SBA comments at 14.

[805] *See, e.g.*, NYNEX reply at 30; Bell Atlantic reply at 10; Ameritech comments at 17; SBC reply at 21.

[806] Bell Atlantic reply at 10; GTE reply at 19-20.

[807] Bell Atlantic comments at 24; Ameritech reply at 14-15; U S West comments at 50 n.109.

[808] Ameritech comments at 38 n.62.

interconnection agreement with Ameritech.[809] Rural Telephone Coalition and GVNW contend that subloop unbundling could be particularly burdensome to smaller LECs whose networks were not designed for this type of access.[810]

376. A majority of commenters, particularly incumbent LECs, argue that subloop unbundling is best addressed in the context of specific requests by competing carriers.[811] AT&T suggests that the Commission could declare that subloop elements are network elements under section 251(c)(3), but not require them to be tariffed until the incumbent LEC receives a request for such elements.[812] Incumbent LECs also argue that subloop unbundling raises significant technical issues, and explain in detail many of the complexities involved.[813] In addition, Sprint and several incumbent LECs maintain that subloop unbundling would raise difficult administrative questions, such as the tracking, pricing, billing, maintenance and repair of subelements.[814] Various parties assert that the costs to reengineer parts of the loop and develop operational support systems for subloop elements will raise the price of subloop elements to prohibitively high levels.[815]

c. Discussion

377. We conclude that incumbent LECs must provide local loops on an unbundled basis to requesting carriers. We note that the Joint Explanatory Statement lists local loops as an

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[809] Ameritech reply at 17.

[810] Rural Tel. Coalition comments at 32; GVNW comments at 26-27.

[811] Bell Atlantic comments at 22; Mass. Commission comments at 7; Cincinnati Bell reply at 7; NTIA reply at 10; GTE comments at 34; NYNEX comments at 67-68; Ameritech comments at 41-42; USTA comments at 32; BellSouth comments at 39 n.85; Sprint comments at 32; *see also* Ameritech reply at 17 (some types of subloop unbundling may be technically feasible but are difficult to identify in the absence of specific requests).

[812] AT&T reply at 17.

[813] Letter from Sandra Wagner, Director - Federal Regulatory, SBC Communications, to William F. Caton, Acting Secretary, FCC, June 4, 1996 (SBC June 4 *Ex Parte*); *see also* PacTel reply at 18 (access at the NID would require incumbent LECs to construct a separate NID for use by the requesting carrier to preserve network security and customer privacy); Ameritech reply at 19 (NID unbundling ignores function of "overvoltage protection" provided by NID).

[814] Sprint comments at 30-31; GTE comments at 33-34; NYNEX comments at 68-69; Bell Atlantic comments at 24; U S West comments at 50-51; BellSouth comments at 39; Ameritech comments at 41.

[815] GTE comments, Attachment 1 at 1; Sprint comments at 32; U S West reply at 25; NYNEX comments at 69; *see also* Ameritech comments, Attachment 1 at 4 (service activation cost for subloop elements would be 53 percent higher than for activation of an unbundled loop).

example of an unbundled network element.[816] As discussed below, the record demonstrates that it is technically feasible for incumbent LECs to provide access to unbundled local loops, and that such access is critical to encouraging market entry. Further, the competitive checklist contained in section 271 requires BOCs to offer unbundled loops separate from switching as a precondition to entry into the in-region, interLATA services market.[817]

378. Requiring incumbent LECs to make available unbundled local loops will facilitate market entry and improve consumer welfare. Without access to unbundled local loops, new entrants would need to invest immediately in duplicative facilities in order to compete for customers. Such investment and building would likely delay market entry and postpone the benefits of local telephone competition for consumers. Moreover, without access to unbundled loops, new entrants would be required to make a large initial sunk investment in loop facilities before they had a customer base large enough to justify such an expenditure.[818] This would increase the risk of entry and raise the new entrant's cost of capital. By contrast, the ability of a new entrant to purchase unbundled loops from the incumbent LEC allows the new entrant to build facilities gradually, and to deploy loops for its customers where it is efficient to do so. Moreover, in some areas, the most efficient means of providing competing service may be through the use of unbundled loops. In such cases, preventing access to unbundled loops would either discourage a potential competitor from entering the market in that area, thereby denying those consumers the benefits of competition, or cause the competitor to construct unnecessarily duplicative facilities, thereby misallocating societal resources.

379. Section 251(c)(3) requires incumbent LECs to provide access to unbundled elements "at any technically feasible point."[819] The vast majority of commenters, including incumbent LECs, agree with our tentative conclusion that it is technically feasible to provide access to unbundled local loops,[820] and a number of commenters identify the main distribution frame in a LEC central office as an appropriate access point.[821] Moreover, access to unbundled

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[816] Joint Explanatory Statement at 116.

[817] 47 U.S.C. § 271(c)(2)(B).

[818] As of year end 1995, Class A carriers reported $268 billion of total plant in service, of which $229 billion was classified as network plant. Local loop plant comprises approximately $109 billion of total plant in service, which represents 41 percent of total plant in service and 48 percent of network plant. *See* 1995 ARMIS Report 43-04.

[819] 47 U.S.C. § 251(c)(3).

[820] *See, e.g.*, PacTel reply at 18; New York Commission comments at 26; SBA comments at 13-14; TIA comments at 9; GTE reply at 18; NYNEX comments at 64-65.

[821] *See, e.g.*, Bell Atlantic comments, Albers Attachment at 6-8; Ameritech comments at 36.

loops is currently provided by several LECs pursuant to state unbundling requirements.[822] Thus, we conclude that it is technically feasible for incumbent LECs to provide access to unbundled local loops at, for example, a central office distribution frame.

380. We further conclude that the local loop element should be defined as a transmission facility between a distribution frame, or its equivalent, in an incumbent LEC central office, and the network interface device at the customer premises. This definition includes, for example, two-wire and four-wire analog voice-grade loops, and two-wire and four-wire loops that are conditioned to transmit the digital signals needed to provide services such as ISDN, ADSL, HDSL, and DS1-level signals.[823] We note that a number of parties proposed definitions of the local loop that encompassed some or all of these loop types.[824] In addition, we agree with ITIC that the ability to offer various digital loop functions in competition with incumbent LECs may be particularly beneficial to small entities by allowing them to serve niche markets.[825]

381. Incumbent LECs are required to provide access to these transmission facilities only to the extent technically feasible. That is, if it is not technically feasible to condition a loop facility to support a particular functionality, the incumbent LEC need not provide unbundled access to that loop so conditioned. For example, a local loop that exceeds the maximum length allowable for the provision of a high-bit-rate digital service could not feasibly be conditioned for such service.[826] Such a situation may necessitate a request for subloop elements.[827] Nevertheless, section 251(c)(3) does not limit the types of telecommunications services that competitors may provide over unbundled elements to those offered by the incumbent LEC.

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[822] *See, e.g.*, Ameritech comments at 36 (by the end of 1996, over 45,000 of its unbundled loops will be used by interconnecting carriers); Frontier comments at 14 (Rochester Telephone is currently providing unbundled loops pursuant to tariff); *see also* Alabama Commission Comments at 18; Texas Commission comments at 17; New York Commission comments at 26; Arizona Commission comments, Exh. V at 8.

[823] ISDN (Integrated Services Digital Network) at the Basic Rate Interface level permits the transmission of digital signals over the loop at the rate of 144 kbps, which provides two standard 64 kbps voice or data channels and a 16 kbps data channel. ISDN at the Primary Rate Interface permits 23 standard 64 kbps channels plus one 16 kbps data channel. ADSL (Asynchronous Digital Subscriber Line) is a transmission path that facilitates 6 Mbps digital signal downstream and 640 kbps digital signal upstream, while simultaneously carrying an analog voice signal. Two-wire HDSL (High-bit-rate Digital Subscriber Line) permits the transmission of a 768 kbps digital signal over a copper loop, while four-wire HDSL allows the transmission of 1.544 Mbps over two two-wire pairs.

[824] *See, e.g.*, MFS comments at 43-44; ALTS comments at 27; GST comments at 21-22; ACSI comments, Att. 1 at 2.

[825] ITIC comments at 7-8.

[826] Such loop conditioning may involve removing load coils or bridged taps that interfere with the transmission of digital signals.

[827] *See, e.g.*, Bell Atlantic reply at 10 n.11.

382. Our definition of loops will in some instances require the incumbent LEC to take affirmative steps to condition existing loop facilities to enable requesting carriers to provide services not currently provided over such facilities. For example, if a competitor seeks to provide a digital loop functionality, such as ADSL, and the loop is not currently conditioned to carry digital signals, but it is technically feasible to condition the facility, the incumbent LEC must condition the loop to permit the transmission of digital signals. Thus, we reject BellSouth's position that requesting carriers "take the LEC networks as they find them" with respect to unbundled network elements.[828] As discussed above, some modification of incumbent LEC facilities, such as loop conditioning, is encompassed within the duty imposed by section 251(c)(3).[829] The requesting carrier would, however, bear the cost of compensating the incumbent LEC for such conditioning.[830]

383. We further conclude that incumbent LECs must provide competitors with access to unbundled loops regardless of whether the incumbent LEC uses integrated digital loop carrier technology, or similar remote concentration devices, for the particular loop sought by the competitor. IDLC technology allows a carrier to aggregate and multiplex loop traffic at a remote concentration point and to deliver that multiplexed traffic directly into the switch without first demultiplexing the individual loops. If we did not require incumbent LECs to unbundle IDLC-delivered loops, end users served by such technologies would not have the same choice of competing providers as end users served by other loop types. Further, such an exception would encourage incumbent LECs to "hide" loops from competitors through the use of IDLC technology.

384. We find that it is technically feasible to unbundle IDLC-delivered loops. One way to unbundle an individual loop from an IDLC is to use a demultiplexer to separate the unbundled loop(s) prior to connecting the remaining loops to the switch. Commenters identify a number of other methods for separating out individual loops from IDLC facilities, including methods that do not require demultiplexing.[831] Again, the costs associated with these mechanisms will be recovered from requesting carriers.

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[828] BellSouth comments at 39.

[829] *See supra* Section IV.D., interpreting the term "technically feasible." *See also* MFS comments at 43 (arguing that incumbent LECs condition loops in order to provide particular digital loop functionalities to their customers).

[830] *See supra* Section VII, discussing the recovery of costs under section 252(d)(1).

[831] Under more recent standards for IDLC facilities, a competitor's loop traffic could be separated from the incumbent LEC's loop traffic without the use of multiplexers. *See, e.g.,* MCI comments at 30 (IDLC loops can be moved onto other loop carrier links, or alternatively, can be removed from the mulitiplexed signal through "hair pinning").

385. We decline to define a loop element in functional terms, rather than in terms of the facility itself. Some parties advocate defining a loop element as merely a functional piece of a shared facility, similar to capacity purchased on a shared transport trunk.[832] According to these parties, this definition would enable an IXC to purchase a loop element solely for purposes of providing interexchange service. While such a definition, based on the types of traffic provided over a facility, may allow for the separation of costs for a facility dedicated to one end user, we conclude that such treatment is inappropriate. Giving competing providers exclusive control over network facilities dedicated to particular end users provides such carriers the maximum flexibility to offer new services to such end users. In contrast, a definition of a loop element that allows simultaneous access to the loop facility would preclude the provision of certain services in favor of others. For example, carriers wishing to provide solely voice-grade service over a loop would preclude another carrier's provision of a digital service, such as ISDN or ADSL, over that same loop.[833] We note that these two types of services could be provided by different carriers over, for example, separate two-wire loop elements to the same end user.

386. Incumbent LECs must provide cross-connect facilities, for example, between an unbundled loop and a requesting carrier's collocated equipment, in order to provide access to that loop. As we conclude in section IV.D, above, an incumbent LEC must take the steps necessary to allow a competitor to combine its own facilities with the incumbent LEC's unbundled network elements. We highlight this requirement for unbundled loops because of allegations by competitive providers that incumbent LECs have imposed unreasonable rates, terms, and conditions for such cross-connect facilities in the past.[834] Incumbent LECs may recover the cost of providing such facilities in accordance with our rules on the costs of interconnection and unbundling. Charges for all such facilities must meet the cost-based standard provided in section 252(d)(1), and the terms and conditions of providing these facilities must be reasonable and nondiscriminatory under section 251(c)(3).

387. At this time, we decline to adopt additional terms and conditions, such as the five-minute loop cutover requirement proposed by MFS, for loop provisioning. We agree with commenters who contend that the provisioning of unbundled local loops must be subject to close scrutiny to ensure that incumbent LECs do not delay loop cutover or otherwise complicate the acquisition of loops by a competitor. We conclude, however, that the rules we adopt in the Access to Unbundled Network Elements section that require nondiscriminatory terms and conditions for provisioning, billing, testing, and repair of unbundled elements, and the

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[832] *See, e.g.*, Cable & Wireless comments at 26-27; ACTA comments at 17.

[833] Digital services such as ISDN and ADSL occupy the same frequency spectrum on a loop as ordinary voice-grade services.

[834] Intermedia comments at 8-9; Teleport comments at 36-37.

availability of electronic ordering systems, adequately address these concerns. We will continue to review and revise our rules in this area as necessary.

388. Section 251(d)(2)(A) requires the Commission to consider whether "access to such network elements as are proprietary in nature is necessary."[835] Most parties did not identify any proprietary concerns associated with providing unbundled access to local loops. Ericsson notes that some "active" loop equipment, such as channel banks and remote terminal equipment, is often proprietary in nature, and that manufacturers would require time to modify such equipment to create end-to-end network compatibility on a national basis.[836] Ericsson does not contend, however, that any proprietary information would be revealed if loops using such equipment were unbundled, or that use of such equipment should prevent loop unbundling in general.[837] Thus, we conclude that loop elements are, in general, not proprietary in nature under our interpretation of section 251(d)(2)(A). Even if loop elements were proprietary in nature, however, Ericsson does not meet the second consideration in our section 251(d)(2)(A) standard, which requires a showing that a new entrant can offer the proposed telecommunications service through the use of other, nonproprietary elements in the incumbent LEC's network.[838] Ericsson merely contends that manufacturers may need time to establish compatibility between its proprietary equipment and equipment of other manufacturers.[839] Therefore, we find that Ericsson's concerns do not justify withholding unbundled loops from requesting carriers pursuant to section 251(d)(2)(A).

389. Section 251(d)(2)(B) directs the Commission to consider whether "the failure to provide access to such network elements would impair the ability of the telecommunications carrier seeking access to provide the services that it seeks to offer."[840] We have interpreted the term "impair" to mean either increased cost or decreased service quality that would result from using network elements of the incumbent LEC other than the one sought.[841] Commenters do not identify alternative facilities that would fulfill requesting carriers' need for transmission between the central office and the customer premises at the same cost and same quality of service. Accordingly, we conclude that competitors' ability to provide telephone exchange, exchange

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[835] 47 U.S.C. § 251(d)(2)(A).

[836] Ericsson comments at 4.

[837] Ericsson's comments were in response to a question in the NPRM seeking comment on the need to accommodate new loop technologies or services. Ericsson comments at 4.

[838] *See supra* Section V.E.3.

[839] Ericsson comments at 4-5.

[840] 47 U.S.C. § 251(d)(2)(B).

[841] *See supra* Section V.E.3.

access, or other telecommunications services would be significantly impaired if they did not have the opportunity to purchase unbundled loops from incumbent LECs.

390. As a general matter, we believe that subloop unbundling could give competitors flexibility in deploying some portions of loop facilities, while relying on the incumbent LEC's facilities where convenient. For example, a competitor may seek to minimize its reliance on the LEC's facilities by combining its own feeder plant with the incumbent LEC's distribution plant.[842] In addition, some high bandwidth services, such as ADSL, cannot be provided over long loop lengths. ITIC, Compaq, and Intel assert that subloop unbundling would lead to innovative new data services.[843] In these situations, carriers would need access at points along the loop closer to the customer premises. The record presents evidence primarily of logistical, rather than technical, impediments to subloop unbundling.[844] Several LECs and USTA, for example, assert that incumbent LECs would need to create databases for identifying, provisioning, and billing for subloop elements.[845] Further, incumbent LECs argue that there is insufficient space at certain possible subloop interconnection points.[846] We note that these concerns do not represent "technical" considerations under our interpretation of the term "technically feasible."[847]

391. Nonetheless, we decline at this time to identify the feeder, feeder/distribution interface (FDI), and distribution components of the loop as individual network elements. We find that proponents of subloop unbundling do not address certain technical issues raised by incumbent LECs concerning subloop unbundling. Incumbent LECs contend that access by a competitor's personnel to loop equipment necessary to provide subloop elements, such as the

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[842] Subloop unbundling could have network efficiency advantages as well. One party notes that subloop unbundling could allow packetized data traffic to be shifted to a data network, rather than flowing through the circuit-switched network portions of the public switched network. *See* ITIC July 16 *Ex Parte*.

[843] ITIC July 16 *Ex Parte*, ITAA July 22 *Ex Parte*, Compaq July 23 *Ex Parte*, Intel July 25 *Ex Parte*. ITAA contends that subloop unbundling would allow data and other traffic to be routed before it reaches an incumbent LEC's central office switch. According to ITAA, such routing would moot incumbent LECs' argument that traffic from the Internet and other on-line services is negatively impacting their switches. ITAA July 19 *Ex Parte*.

[844] *See, e.g.*, Sprint comments at 30-31; GTE comments at 33-34; NYNEX comments at 68-69; Bell Atlantic comments at 24 (all discussing a variety of tracking, billing, and maintenance issues that would be raised by subloop unbundling).

[845] USTA comments at 31; NYNEX comments at 69; Ameritech comments at 41; BellSouth comments at 39; U S West comments at 50.

[846] Bell Atlantic comments at 24; SBC comments at 38; NYNEX comments at 66.

[847] *See supra* Section IV.D.

FDI, raise network reliability concerns for customers served through that FDI.[848] SBC, for example, asserts that access to its loop concentration points by competitors would increase the risk of error by a competitor's technicians that may disrupt service to customers of one or both carriers.[849] U S West contends that the potential for poor technical implementation of subloop interconnection and the lack of overall responsibility for loop performance is very likely to degrade overall service quality.[850] Proponents of subloop unbundling do not adequately respond to these arguments by incumbent LECs. As discussed above, we have determined that we must take into account specific, demonstrable claims regarding network reliability in determining whether to identify any particular component as an element that must be unbundled. Therefore, we believe that, at this stage, based on the current record evidence, the technical feasibility of subloop unbundling is best addressed at the state level on a case-by-case basis at this time.[851] Information developed by the parties in the context of a specific request for subloop unbundling will provide a useful framework for addressing the loop maintenance and network reliability matters that we have identified. Based on actions taken by the states or other future developments, and on the importance of subloop unbundling in light of technological advancements, we intend to revisit the specific issue of subloop unbundling sometime in 1997.

392. We require incumbent LECs to offer unbundled access to the network interface device (NID),[852] as a network element, as described below. When a competitor deploys its own loops, the competitor must be able to connect its loops to customers' inside wiring in order to provide competing service, especially in multi-tenant buildings. In many cases, inside wiring is connected to the incumbent LEC's loop plant at the NID. In order to provide service, a competitor must have access to this facility. Therefore, we conclude that a requesting carrier is entitled to connect its loops, via its own NID, to the incumbent LEC's NID.[853]

393. Pursuant to section 251(c)(3), we find that this arrangement clearly is technically feasible. Ameritech notes that it currently maintains such connections with competitors that have

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[848] BellSouth comments at 39; NYNEX comments at 66; SBC comments at 39; U S West comments at 52 n.113; PacTel comments at 18.

[849] SBC comments at 39.

[850] U S West comments at 52 n.113.

[851] We encourage states to pursue subloop unbundling in response to requests for subloop elements by competing providers.

[852] The NID is a cross-connect device used to connect loop facilities to inside wiring.

[853] We emphasize that access to inside wiring through the incumbent LEC's NID does not entitle a competitor to deliver its loop facilities into a building without the permission of the building owner. Similarly, access to an incumbent LEC's NID does not entitle the competitor to the riser and lateral cables between the NID and individual units within the building, which may be owned or controlled, for example, by the premises owner.

deployed their own loop facilities.[854] This is persuasive evidence that unbundled access at the NID, in this manner, does not raise network reliability concerns. Under section 251(d)(2)(A), the record contains no evidence of proprietary concerns with unbundled access to the NID. In addition, under our interpretation of the "impair" test of section 251(d)(2)(B), commenters do not contend that new entrants could obtain the same functionality at the same cost and service quality through other network elements of the incumbent LEC. Moreover, the record indicates that certain network architectures used by new entrants, such as fiber rings, can most efficiently connect end users to the new entrant's switching office without use of the incumbent LEC's facilities.[855] Thus, we conclude that the unavailability of access to incumbent LECs' NIDs would impair the ability of carriers deploying their own loops to provide service. Further, we believe that unbundled access to the NID will facilitate entry strategies premised on the deployment of loops. As discussed in section VII, above, the new entrant bears the costs connecting its NID to the incumbent LEC's NID.

394. We do not require an incumbent LEC to permit a new entrant to connect its loops directly to the incumbent LEC's NID. MCI contends that directly connecting its loops to incumbent LECs' NIDs is "[t]he only practical solution" for gaining access to inside wiring.[856] According to MCI, there is no extra wiring to connect the incumbent LEC's NID to the new entrant's NID.[857] Ameritech demonstrates, however, that it currently provides access to inside wiring through the type of arrangement that MCI asserts is not practical -- that is, by connecting a new entrant's loops to inside wiring via the new entrant's NID and Ameritech's NID. MCI does not demonstrate that its ability to provide competing service is unreasonably limited by the arrangements explained by Ameritech.

395. The record contains conflicting evidence on the technical feasibility of requiring incumbent LECs to permit competitors to connect their loops directly to incumbent LECs' NIDs. Ameritech asserts that such a direct connection would leave Ameritech's unused loops without overvoltage protection.[858] MCI argues that overvoltage protection is provided through the incumbent LEC's "protector module" that is separate from the NID.[859] Ameritech responds that

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[854] Letter from James K. Smith, Director-Federal Relations, Ameritech, to William F. Caton, Acting Secretary, FCC, July 15, 1996 (Ameritech July 15 *Ex Parte*).

[855] Letter from Don Sussman, MCI, to William F. Caton, FCC, July 12, 1996 (MCI July 12 *Ex Parte*).

[856] MCI July 12 *Ex Parte* at 6.

[857] *Id.* at 5.

[858] Ameritech July 15 *Ex Parte* at 5.

[859] Letter from Donald Evans, Vice President - Federal Regulatory Affairs, MCI, to William F. Caton, Secretary, FCC, July 16, 1995 (MCI July 16 *Ex Parte*).

its NIDs are integrated units providing both overvoltage protection and a demarcation point, and that these two functions of the NID are "inseverable."[860] AT&T contends direct access to incumbent LECs NIDs is technically feasible. According to AT&T, if a competitor connects its loops directly to the incumbent LEC's NID, the incumbent LEC's loops remain connected to the grounding equipment that protects against overvoltage.[861] According to AT&T, when the competitor does not use spare terminals on the NID, the competitor would be required to ground the incumbent LEC's unused loops to protect against overvoltage.[862]

396. We find that the record in this proceeding does not permit a determination on the technical feasibility of the direct connection of a competitor's loops to the incumbent LEC's NID. Our requirement of a NID-to-NID connection addresses the most critical need of competitors that deploy their own loops -- obtaining access to the inside wiring of the building. We recognize, however, that competitors may benefit by directly connecting their loops to the incumbent LEC's NID, for example, by avoiding the cost of deploying NIDs.[863] States should determine whether direct connection to the NID can be achieved in a technically feasible manner in the context of specific requests by competitors for direct access to incumbent LECs' NIDs.[864]

2. Switching Capability

a. Background

397. In the NPRM, we tentatively concluded that incumbent LECs should be required to make available local switching capability as an unbundled network element. We sought comment on how a local switching element should be defined, and we identified two possible models: the switch "platform" approach, which would entitle and require a requesting carrier to purchase all of the features and functions of the switch on a per-line basis and the port approach used by the New York Commission, which offers local switching capability through the purchase of a port at a retail rate. We also sought comment on other definitions of a local switching element. In addition, we requested that commenters address whether vertical switching functions, such as those enabling the provision of custom local area signaling service (CLASS)

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[860] Letter from James Smith, Director-Federal Relations, Ameritech, to William F. Caton, Acting Secretary, FCC, July 24, 1996 (Ameritech July 24 *Ex Parte*).

[861] Letter from Bruce Cox, Government Affairs Director, AT&T, to William F. Caton, Acting Secretary, FCC, July 18, 1996 (AT&T July 18 *Ex Parte*).

[862] *Id.*

[863] *Id.* at 1.

[864] Ameritech July 15 *Ex Parte* at 5-6.

features and call waiting, should be considered individual network elements separate from the basic switching functionality.

b. Comments

398. The vast majority of commenters support the Commission's tentative conclusion that local switching should be an unbundled network element.[865] Such parties note that the section 271 competitive checklist includes unbundled local switching and the legislative history of the 1996 Act identifies local switching as a possible element.[866] Several potential local competitors contend that unbundled local switching functionality is very important to promote entry into the local exchange market.[867]

399. Some incumbent LECs support a definition of local switching as a switching port.[868] These LECs favor a definition of a port that focuses on *providing access* to additional switching features, rather than on the switching features themselves.[869] PacTel, for example, asserts that a port provides dialtone and a telephone number, but does not include local usage or vertical features such as custom calling.[870] Bell Atlantic contends that the 1996 Act requires incumbent LECs to *provide access* to unbundled network elements, and that a switch port meets this directive by providing access to the switch.[871]

400. Sprint, USTA, SBC, NYNEX, and MECA, on the other hand, favor a definition of the unbundled local switching element that includes the basic function of connecting network

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[865] *See, e.g.*, GCI comments at 12; TIA comments at 11-12; Citizens Utilities comments at 15; Intermedia comments at 13; Bay Springs, *et al.* comments at 18; Wyoming Commission comments at 22.

[866] *See, e.g.*, Ameritech comments at 43; LDDS comments at 44; USTA comments at 32; BellSouth comments at 40.

[867] LDDS reply at 18; TIA comments at 18; AT&T March 21 Letter 18 at 17-18; *but see* SBC reply at 23 ("Given that 'high margin' services are made possible through the switch, new entrants will likely purchase their own switching facilities.").

[868] BellSouth comments at 41; Cincinnati Bell comments at 18; U S West comments at 54-55; Bell Atlantic comments at 25; GTE comments at 37.

[869] BellSouth comments at 41; Cincinnati Bell comments at 18; USTA comments at 33; U S West comments at 54-55; Bell Atlantic comments at 25; GTE comments at 37; NYNEX comments at 69-70.

[870] PacTel comments at 55 (local usage should be excluded from the definition of a port because it is a tariffed service and should therefore be available to requesting carriers only through resale); *see also* SBC comments at 43 (the port should be separate from the switch).

[871] Bell Atlantic reply at 12.

access lines to other lines or trunks.[872] These parties would expressly exclude from this local switching definition vertical features such as custom calling.[873] Sprint and SBC argue that vertical features are retail services offered to end users today, and therefore, must be purchased by the competitor under the wholesale rate provisions of the Act.[874] USTA suggests that this approach best comports with the Act and is a reasonable compromise between the more limited port approach and the switching platform proposal.[875]

401. A number of commenters support a definition of the local switch that has been referred to as the "local switching platform."[876] These parties recommend defining the local switching element as encompassing all functions performed by the local switch, including basic switching functionality and vertical features.[877] Supporters of the switching platform approach contend that, because the requesting carrier would pay for all local switching functionality on a per-line basis, it would have the incentive and ability to combine features and services more effectively than it would under more limited definitions of the local switching element.[878]

402. LDDS and AT&T argue that the switch platform approach is more consistent with the Act than the port approach. These carriers argue that, under the port approach, local switching has not been "unbundled" because a competitor cannot combine a port with loop and trunking facilities to provide telephone service. Instead, the competitor must also purchase basic

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[872] Sprint comments at 34; USTA reply at 16-17; SBC reply at 20; NYNEX reply at 31; MECA comments at 29.

[873] Sprint comments at 36; USTA reply at 16; SBC reply at 20; MECA comments at 29. Examples of vertical features include call waiting and three-way calling, which are custom calling features, and caller ID and call forwarding, which are custom local area signaling service (CLASS) features that rely on the transmission of signaling information between the calling and called parties.

[874] USTA reply at 16-17; PacTel reply at 19; SBC reply at 21; *see also* Sprint comments at 37-38 (although it is not technically feasible to unbundle vertical services, the costs of such services can be identified and should be excluded from the charge for the local switching element).

[875] USTA reply at 16.

[876] MCI comments at 30-32; AT&T comments at 20-21; LDDS comments at 44-46; Texas Commission reply at 8; TCC comments at 37-38; ACTA comments at 18-20; ACSI comments at 40-41; CompTel comments at 33-35; Ad Hoc Telecommunications Users Committee reply at 8.

[877] Functions listed by proponents of the switch platform include local usage, exchange access, access to operators, announcements, recognition of customer requests for service, obtaining call-specific information, data analysis, selection of traffic routes, call signaling, recording for billing and network management, tests required for network maintenance and call processing, custom calling features (*e.g.* call forwarding, call waiting), and CLASS features (*e.g.* caller ID, call return). LDDS comments at 44; ACSI comments at 40-41; MCI comments at 30. AT&T and LDDS also propose to include in the local switching definition Centrex, carrier identification code determination, and access to databases and adjunct processors for the purpose of offering advanced intelligent network (AIN) services. LDDS comments at 45; AT&T Mar. 21 Letter at 18.

[878] LDDS comments at 45; AT&T comments at 21.

switching functionality from the incumbent LEC at wholesale rates.[879] According to AT&T and LDDS, the switching platform does not raise technical feasibility problems because requesting carriers would not have direct access to the switching hardware or software. Instead, the requesting carrier would "designate" the features to be associated with its own lines and the routing of its customers' calls, and the incumbent LEC would actually perform that function.[880]

403. Opponents of the local switching platform assert that implementing a switch platform would cause technical problems. U S West and GVNW argue that the only technically feasible way to implement the switching platform would be physically to partition the switch which, according to U S West, would greatly reduce the switch's efficiency.[881] AT&T characterizes this argument as frivolous and asserts that physical partitioning of the switch has not been proposed by any party.[882] NYNEX contends that incumbent LECs would need to add capacity to their switches to accommodate competitors' demand for switch platforms.[883] AT&T responds that, because the requesting carrier is likely to be serving former customers of the incumbent LEC, the switching resources needed by the incumbent and competitor, at least initially, are likely to balance out.[884] GTE, U S West, and USTA also argue that the switching platform approach would discourage incumbent LECs from upgrading their switches because all new features would be immediately available to competitors at a discounted rate.[885]

404. Incumbent LECs argue that the switch platform would allow a requesting carrier to circumvent the statutory scheme that requires incumbent LECs to offer local exchange service at wholesale rates for resale by requesting carriers.[886] These commenters also contend that vertical features, such as custom calling and call waiting, are retail services, not network elements, and

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[879] LDDS comments at 55; AT&T reply at 18. The Texas Commission notes that Ameritech's unbundled port tariffs in Illinois expressly exclude basic switching functionality. Texas Commission comments at 13-14.

[880] AT&T reply at 19; LDDS reply at 19.

[881] U S West comments at 55.

[882] AT&T reply at 19.

[883] NYNEX reply at 32.

[884] Letter from Bruce Cox, Government Affairs Director, AT&T, to William Caton, Secretary, FCC, June 28, 1996 (AT&T June 28 *Ex Parte*).

[885] GTE comments at 38; SBC comments at 43; USTA reply at 17.

[886] PacTel comments at 54; Bell Atlantic comments at 26; GTE reply at 20; *see also* Sprint comments at 38 (the local switching platform does not create incentives for competitors to build out facilities).

should be obtained by requesting carriers pursuant to section 251(c)(4).[887] Ad Hoc Telecommunications Users maintains that the switch platform approach raises entry costs by forcing competitive providers to purchase switching functions they may never need or use.[888] MCI and TCC contend that the local switching element should specifically include vertical features such as CLASS features and custom calling because incumbent LECs do not incur the costs for these services on a usage basis.[889] ACSI and LCI also support the availability of vertical switching functionalities on an unbundled basis.[890]

405. Incumbent LECs contend that the switch platform approach is impractical because standard measures of switching, such as the number of line or trunk terminations, would not capture the dynamic nature of switching.[891] In response, MCI and LDDS state that a requesting carrier would commit to purchasing a minimum level of trunk port capacity and a minimum level of busy hour switch capacity for at least one year.[892] Several BOCs and Sprint contend that the Commission should not adopt the switch platform because there is insufficient understanding of what it would entail.[893]

406. Most parties support the Commission's proposal to require incumbent LECs to unbundle tandem switching as a network element.[894] AT&T notes that the availability of unbundled tandem switches is critical to the connection of its own switches to incumbent LECs' switches.[895] AT&T argues that unbundled tandem switching is technically feasible because IXCs currently interconnect with incumbent LECs' tandem switches through standard specifications.[896] Other commenters indicate that tandem switching is available today through access tariffs, and

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[887] USTA comments at 34-35; Cincinnati Bell comments at 18.

[888] Ad Hoc Telecommunications Users Committee comments at 23.

[889] MCI comments at 31; TCC comments at 31.

[890] ACSI comments at 41; LCI comments at 18.

[891] USTA comments at 34; MECA comments at 30.

[892] MCI comments at 30; LDDS comments at 44-45.

[893] Ameritech comments at 45; SBC comments at 42; Bell Atlantic reply at 11; Sprint comments at 39; NYNEX reply at 31.

[894] *See, e.g.*, AT&T comments at 22; New York Commission comments at 27; U S West comments at 48; MCI comments at 17; Competition Policy Institute comments at 16; GST comments at 24; TIA comments at 13.

[895] AT&T Mar. 21 Letter at 21.

[896] AT&T comments at 22; ALTS comments at 30.

therefore it is unnecessary for the Commission to unbundle tandem switching.[897] SBC states that the Commission should not apply the same unbundling requirements for tandem and end office switches because tandem switches only offer trunk interfaces and do not contain switching features on a per-line basis.[898]

407. AT&T, MCI, and TCC also ask that the local switching element be defined to include data switching by packet switches.[899] MCI asserts that it is technically feasible for the requesting carrier's own facilities to interface with an incumbent LEC's packet switch through a connection at a DS1 frame or patch panel.[900] PacTel supports the unbundling of data switches as network elements.[901]

408. Several potential local competitors argue that the Commission should require incumbent LECs, in providing unbundled local switching, to enable requesting carriers to designate the trunk assignment for its local exchange customers.[902] CompTel states that this would maximize competitors' ability to create new services.[903] PacTel argues that it is not technically feasible to route local calls originating on unbundled loops onto particular outgoing trunks connected to that switch.[904]

409. ALTS argues that incumbent LECs should be required to make local switching available so that all signaling information necessary to complete a call is passed to the connecting carrier, such as an IXC or a competing provider.[905] The Wyoming Commission is considering adoption of a rule that would require incumbent LECs to pass on signaling

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[897] Bell Atlantic comments at 27; TIA comments at 13.

[898] SBC comments at 34 n.67.

[899] AT&T comments at 20; TCC comments at 39; MCI comments at 18.

[900] MCI comments at 18.

[901] PacTel reply at 21.

[902] ALTS comments, Attachment A at 20-21; LCI comments at 18; TCC reply at 17; *see also* CompTel comments at 34 (the Commission should enable requesting carriers to establish routing parameters for the following categories of traffic: domestic interLATA, presubscribed intraLATA, non-presubscribed intraLATA, 800/888, 900, interLATA operator traffic, intraLATA/0-/0+ operator traffic, and international direct dialed).

[903] CompTel comments at 34.

[904] PacTel reply at 20.

[905] ALTS comments at 29 (claiming that some carriers strip certain signaling information and end offices and tandem offices, thereby undermining the ability of new entrants to receive and aggregate traffic for various IXCs).

information to interconnected carriers, and would also prohibit incumbent LECs from claiming a proprietary right to signaling protocols.[906]

c. Discussion

(1) Local Switching Capability

410. We conclude that incumbent LECs must provide local switching as an unbundled network element. The record supports a finding that it is technically feasible for incumbent LECs to provide access to an unbundled local switching element, and that denying access to a local switching element would substantially impair the ability of many competing carriers to provide switched telecommunications services. We also note that section 271 requires BOCs to offer or provide "[l]ocal switching unbundled from transport, local loop transmission, or other services" as a precondition to providing in-region interLATA services.[907] As discussed below, we identify a local switching element that includes the basic function of connecting lines and trunks as well as vertical switching features, such as custom calling and CLASS features.[908] We agree with the Illinois Commission that defining the switching element in this way will permit competitors to compete more effectively by designing new packages and pricing plans.[909]

411. In the United States, there are over 23,000 central office switches, the vast majority of which are operated by incumbent LECs.[910] It is unlikely that consumers would receive the benefits of competition quickly if new entrants were required to replicate even a small percentage of incumbent LECs' existing switches prior to entering the market. The Illinois Commission staff presented evidence in a recent proceeding indicating that it takes between nine months and two years for a carrier to purchase and install a switch.[911] We find this to be persuasive evidence of the entry barrier that would be created if new entrants were unable to obtain unbundled local

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[906] Wyoming Commission comments at 24.

[907] 47 U.S.C. § 271(c)(2)(B)(vi).

[908] Custom calling features, such as call waiting, three-way calling, and call forwarding, are switch-based calling functions. CLASS features, such as caller ID, are number translation services that are based on the availability of interoffice signaling.

[909] *AT&T Communications of Illinois, Petition for a Total Local Exchange Wholesale Service Tariff from Illinois Bell Telephone Company Pursuant to Section 13-505.5 of the Illinois Public Utilities Act*, Order, Docket Nos. 95-0458 and 95-0531, June 26, 1996 (Illinois Wholesale Order) at 63-66.

[910] *Statistics of Communications Common Carriers*, Federal Communications Commission, 1994/1995 Edition, at Table 2.4. This figure is derived from carriers filing with the FCC, which represent approximately 92 percent of the industry.

[911] Supplemental Rebuttal Testimony of Jake Jennings, Office of Policy and Planning, Illinois Commerce Commission, ICC Staff Ex. 1.04, Docket No. 95-0458, at 11-12 (Mar. 11, 1996).

switching from the incumbent LEC. The ability to purchase unbundled switching will also promote competition in an area until the new entrant has built up a sufficient customer base to justify investing in its own switch. We expect that the availability of unbundled local switching is likely to increase the number of carriers that will successfully enter the market, and thus should accelerate the development of local competition.

412. We define the local switching element to encompass line-side and trunk-side facilities plus the features, functions, and capabilities of the switch.[912] The line-side facilities include the connection between a loop termination at, for example, a main distribution frame (MDF), and a switch line card.[913] Trunk-side facilities include the connection between, for example, trunk termination at a trunk-side cross-connect panel and a trunk card. The "features, functions, and capabilities" of the local switch include the basic switching function of connecting lines to lines, lines to trunks, trunks to lines, trunks to trunks. It also includes the same basic capabilities that are available to the incumbent LEC's customers, such as a telephone number, directory listing, dial tone, signaling, and access to 911, operator services, and directory assistance.[914] In addition, the local switching element includes all vertical features that the switch is capable of providing, including custom calling, CLASS features, and Centrex, as well as any technically feasible customized routing functions. Thus, when a requesting carrier purchases the unbundled local switching element, it obtains all switching features in a single element on a per-line basis. A requesting carrier will deploy individual vertical features on its customers' lines by designating, via an electronic ordering interface, which features the incumbent LEC is to activate for particular customer lines.

413. We disagree with commenters who argue that vertical switching features should be classified exclusively as retail services, available to competing providers only through the resale provision of section 251(c)(4).[915] The 1996 Act defines network element as "a facility or

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[912] The NPRM used the terms "switch platform" and "port," as they had been developed by the Illinois and New York Commissions, respectively, to describe two possible approaches to establishing an unbundled local switching element. Parties commenting on the unbundled switching element attributed a variety of functionalities to each of these terms. To avoid confusion, we will not use these terms in discussing the unbundled local switching element. Instead, we will address commenters' proposals according to the functionality that they recommend be included in the definition of an unbundled local switching element.

[913] A line card is a plug-in electronic printed circuit card that operates ringing, holding, and other features associated with one or several telephone lines.

[914] Purchasing the local switching element does not entitle a requesting carrier to connect its own AIN call processing database to the incumbent LEC's switch, either directly or via the incumbent LEC's signal transfer point or database. Section V.I.4, which discusses the unbundling of incumbent LECs' signaling systems and databases. We also note that E911 and operator services are further unbundled from local switching. *See infra* Section V.I.6.

[915] Section 251(c)(4)(A) requires incumbent LECs "to offer for resale at wholesale rates any telecommunications service that the carrier provides at retail to subscribers who are not telecommunications carriers." 47 U.S.C. § 251(c)(4)(A).

equipment used in the provision of a telecommunications service" and "the features, functions, and capabilities that are provided by means of such facility or equipment."[916] Vertical switching features, such as call waiting, are provided through operation of hardware and software comprising the "facility" that is the switch, and thus are "features" and "functions" of the switch.[917] We note that the Illinois Commission recently defined an unbundled local switching element to include vertical switching features.[918] Although we find that vertical switching features should be available to competitors through the resale provision of section 251(c)(4), we reject the view that Congress intended for section 251(c)(4) implicitly to remove vertical switching features from the definition of "network element."[919] Therefore, we find that vertical switching features are part of the unbundled local switching element.[920]

414. At this time we decline to require further unbundling of the local switch into a basic switching element and independent vertical feature elements. Such unbundling does not appear to be necessary to promote local competition. Indeed, most potential local competitors do not recommend that vertical switching features be available as separate network elements. MCI, AT&T and LDDS believe that such features should be available to new entrants as part of the local switching element.[921] We also note that additional unbundling of the local switching would not result in a practical difference in the way the local switching element is provisioned. As discussed below, when a competing provider orders the unbundled basic switching element for a particular customer line, it will designate which vertical features should be activated by the incumbent LEC for that line. In addition, the record indicates that the incremental costs associated with vertical switching features on a per-line basis may be quite small,[922] and may not justify the administrative difficulty for the incumbent LEC or the arbitrator to determine a price for each vertical element. Thus, states can investigate, in arbitration or other proceedings,

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[916] 47 U.S.C. § 153(29).

[917] In some cases vertical features may be provided using hardware and software external to the actual switch. In those instances, the functionality of such external hardware and software is a separate element under section 251(c)(3), and is available to competing providers. *See infra* Section V.I.4, discussing unbundled signaling and databases.

[918] *Illinois Wholesale Order* at 63-66.

[919] *See supra* Section V.H, rejecting arguments that services available for resale under section 251(c)(4) cannot be provided via unbundled elements.

[920] *See infra* Section VII.C.2.b.2, concerning the pricing of an unbundled switching element.

[921] AT&T June 28 *Ex Parte* at 1-2; MCI comments at 31; LDDS comments at 44.

[922] LDDS comments at 57, Letter from Bruce Cox, Government Affairs Director, AT&T, to Elliot Maxwell, FCC, June 25, 1996 (AT&T June 25 *Ex Parte*).

whether vertical switching features should be made available as separate network elements. We will continue to review and revise our rules in this area as necessary.

415. We conclude that providing access to an unbundled local switching element at a LEC central office is technically feasible. We are not persuaded by the argument that shared use of an unbundled switching element would jeopardize network security and reliability by permitting competitors independently to activate and deactivate various switching features. A competing provider will purchase and obtain the local switching element the same way it obtains an unbundled local loop, that is, by ordering, via electronic interfaces,[923] the local switching element and particular vertical switching features.[924] The incumbent LEC will receive the order and activate (or deactivate) the particular features on the customer line designated by the competing provider. Consequently, the incumbent LEC is not required to relinquish control over operations of the switch.

416. We also reject the argument that a definition of local switching that incorporates shared use of a local switch would involve physical partitioning of the switch.[925] The requirements we establish for local switch unbundling do not entail physical division of the switch, and consequently do not impose the inefficiency or technical difficulties identified by some commenters.

417. Nor are we persuaded by the arguments of some incumbent LECs that an unbundled switching element based on shared use of the local switch is technically infeasible because incumbent LECs lack significant excess capacity at any given time. Thus, at least initially, an increase in the use of the local switching element by the requesting carrier is not likely to lead to an enormous, immediate increase in switch use by the incumbent LEC. If incumbent LECs and competing providers believe that they would benefit by quantifying their anticipated demand for switch resources, they are free to do so in the negotiation and arbitration processes. Such planning may be necessary when a competitor anticipates that usage of the local switching element by its customers will place demands on the incumbent LEC's switch that exceed the usage levels anticipated by the incumbent LEC.[926]

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[923] *See infra* Section V.I.4, *infra*, addressing requesting carriers' access to incumbent LECs' ordering and provisioning systems.

[924] Section V.I.5 addresses the arrangements for ordering unbundled network elements.

[925] U S West comments at 55-57.

[926] Bell Atlantic, for example, notes that a competitor's service or pricing packages could stimulate greater switch usage than previously experienced by the incumbent. Letter from Patricia Koch, Assistant Vice President, Bell Atlantic, to William Caton, Acting Secretary, FCC, June 21, 1996 (Bell Atlantic June 21 *Ex Parte*).